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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/777,756	02/13/2004	Ryu Ogiwara	248861US2S	5332

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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

NGUYEN, THINH T

ART UNIT PAPER NUMBER

2818

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/777,756

Applicant(s)

OGIWARA, RYU

Examiner

Thinh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED OFFICE ACTION

1. Applicant election of claims 1-9 for prosecution without traverse in the communication with the Office on 6/27/2005 is acknowledged.

Specification

2. The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant cooperation is requested in correcting any errors of which the applicant may become aware in the specification.

Claim Objections

3. Claim 8 is objected to for the following informalities:

in claim 8 line 5 Applicant recited : -- A gate of the **Bipolar Transistor** being connected to the word line --.

What the Applicant means is probably: A Gate of the **MOS transistor** being connected to the word line – since the Applicant discloses in fig 30 that the **MOS transistor replaces the Bipolar transistor as memory switching element**.

A bipolar transistor usually has a base a control element and not a gate.

Correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102(a/b/e) that form the basis for the rejections under this section made in this office action.

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claim 1,2,4,7,9 are rejected under 35 U.S.C. 102(e) as being anticipated by Kuge (U.S. Patent 6,597,031).

REGARDING CLAIM 1

Kuge discloses (in the title, fig 2,fig 5, fig 11,column 1 lines 16-25) a phase-change memory device comprising: memory cells (fig 1 reference 31a) including phase-change layers formed on a semiconductor substrate, the phase-change layer showing an amorphous-crystalline phase change; a memory cell array which has the memory cells arranged in a matrix, the phase change layer including first regions (fig 2 layer 3) which contact the semiconductor substrate in units of memory cells and a second region (fig 2 layer 41a) which connects the first regions arranged in a same column; a first electrode layer (fig 2 layer 10a) formed on the second

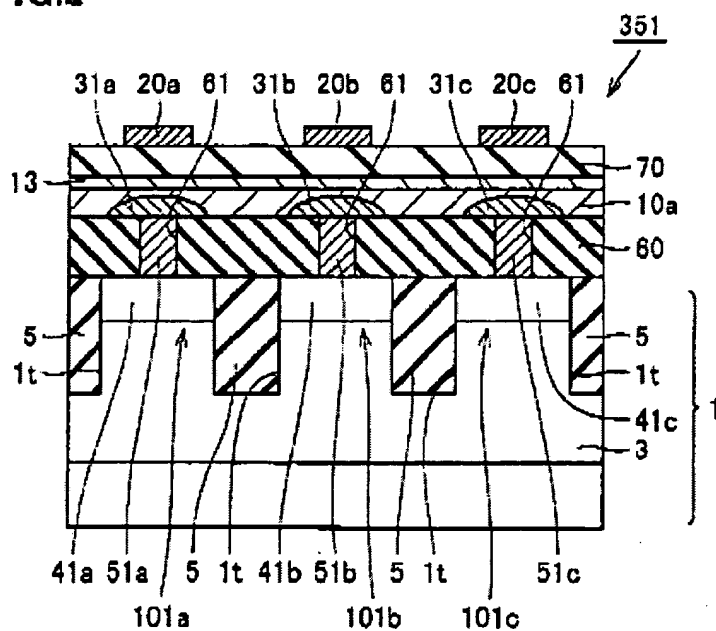


FIG. 5

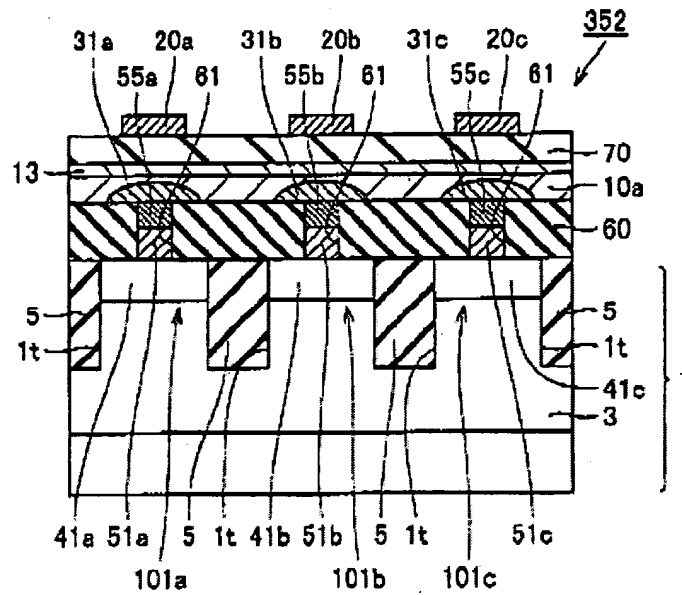
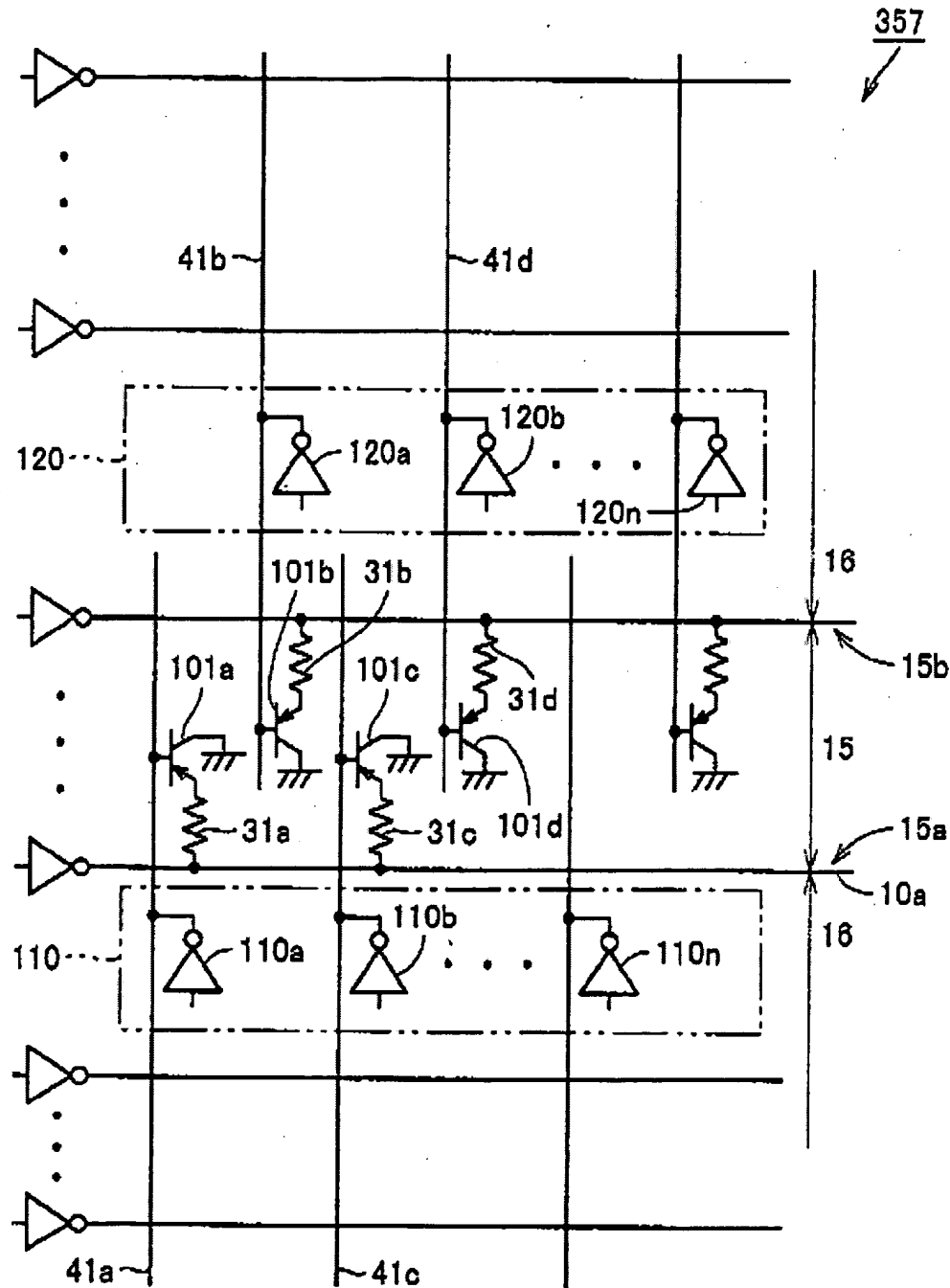


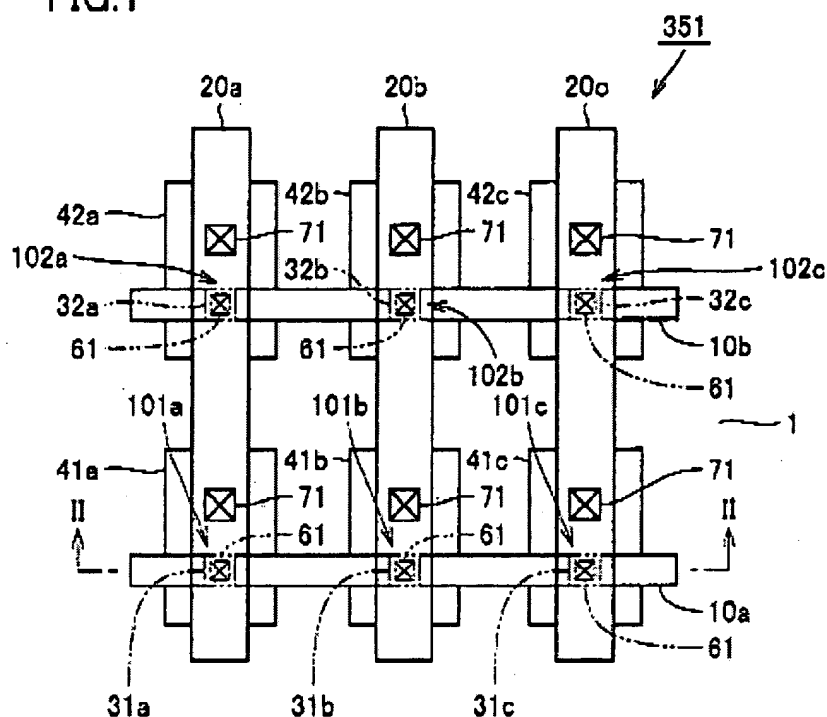
FIG. 11



REGARDING CLAIM 2

Kuge (fig 1,fig 11) discloses a phase change memory device comprising a contact plug, which connects the first electrode layer and the bit line (fig 1 contact hole 61 bit line 10a).

FIG. 1



REGARDING CLAIM 4

Kuge (fig 4) discloses a phase change memory device comprising a resistor element (fig 4 layer 55, column 8 lines 1-6) formed on the semiconductor substrate with respect to each memory cell and provided for each memory cell between the semiconductor substrate and the first region of each phase-change layer, a contact area of the resistor element and each first region being smaller than the contact area of the second region and the first electrode layer.

REGARDING CLAIM 7

Kuge (fig 11) discloses a phase change memory device wherein each memory cell includes a bipolar transistor formed in the semiconductor substrate, a collector or an emitter of the bipolar transistor being connected to a corresponding one of the first regions, a base of the bipolar transistor being connected to the word line (fig 11 line 41a).

REGARDING CLAIM 9.

Kuge (fig 1,column 1 lines 16-25,column 5 lines 5-7) discloses a phase change memory device comprising the second region of each phase-change layer is in a crystalline state, and at least part of each first region of each phase-change layer assumes one of the crystalline state and an amorphous state in accordance with write data.

Noted that even though Kuge does not mentioned that layer 10a is polycrystalline; layer 10a is inherently in polycrystalline state since it is a chalcogenide contact layer while storage layer 31a can change phase from polycrystalline to amorphous.

Claim Rejections - 35 USC § 103

6. The following is a quotation of U.S.C. 103(a) which form the basis for all obviousness rejections set forth in this office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 3, 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuge (US patent 6,597,031) in view of Klersy et al. (US patent 5,536,947).

REGARDING CLAIM 3

Kuge discloses all the invention except for a third region interposed between the second region and each first region, the third region having a width greater than the contact area of each first region and the semiconductor substrate, and less than the contact area of the second region and the first electrode layer. This feature, however, is old and well known in the art as shown in the disclosure by Klersy (fig 1 reference 36, column 14 lines 24-40). Noted that the storage volume of the phase change of the Klersy reference have a T cross-section and inherently has two regions.

It would have been obvious to one of ordinary skill in the art the time the invention was made to combine the teachings by Kuge with the teachings by Klersy et al. and come up with the invention of claim 3.

The rationale is as the following:

a person skilled in the art at the time the invention was made would have been motivated to explore different configuration of the phase change layers using “on the shelf” knowledge to improve the Kuge device.

REGARDING CLAIM 5

Klersy (fig 1 ,layer 48) disclose a second electrode layer interposed between each first region and the semiconductor substrate.

The rationale why claim 5 is obvious under prior art has been discussed in the rejection of claim 3.

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8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuge (US patent 6,597,031) in view of Klersy et al. (US patent 5,536,947) and in further view of Ovshinsky et al. (US patent 5,296,716). All these inventions involve phase change memory structures.

REGARDING CLAIM 6

As discussed in the rejection of claim 3 the combined teachings by Kuge and Klersy disclosed all the invention of claim 6 except for an electrode layer in which the interface surface with the cell storage region is smaller than the interface surface opposing this layer. Ovshinsky, however, discloses a electrode layer (fig 1 layer 24) in which the interface surface with the cell storage region is smaller than the interface surface opposing this layer.

It would have been obvious to one of ordinary skill in the art the time the invention was made to combine the teachings by Kuge with the teachings by Klersy et al. plus the teachings by Ovshinsky et al. and come up with the invention of claim 6.

The rationale is as the following:

A person skilled in the art would have been motivated to increase the stability of the device invented by the combined teachings by Kuge and Klersy as suggested by Ovshinsky in his abstract.

Kuge discloses all the invention except for using a MOSFET switching element. Hush, however, (fig 2) discloses the use of a MOSFET switching element for a phase change memory device.

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It would have been obvious to one of ordinary skill in the art the time the invention was made to combine the teachings by Kuge with the teachings by Hush and come up with the invention of claim 8.

The rationale is as the following:

a person skilled in the art at the time the invention was made would have been motivated to use an alternative of Bipolar Junction Transistor Switch by a MOSFET switch as taught by Hush to improve the device by Kuge since MOSFET are known in the art as consume less power than BJT.

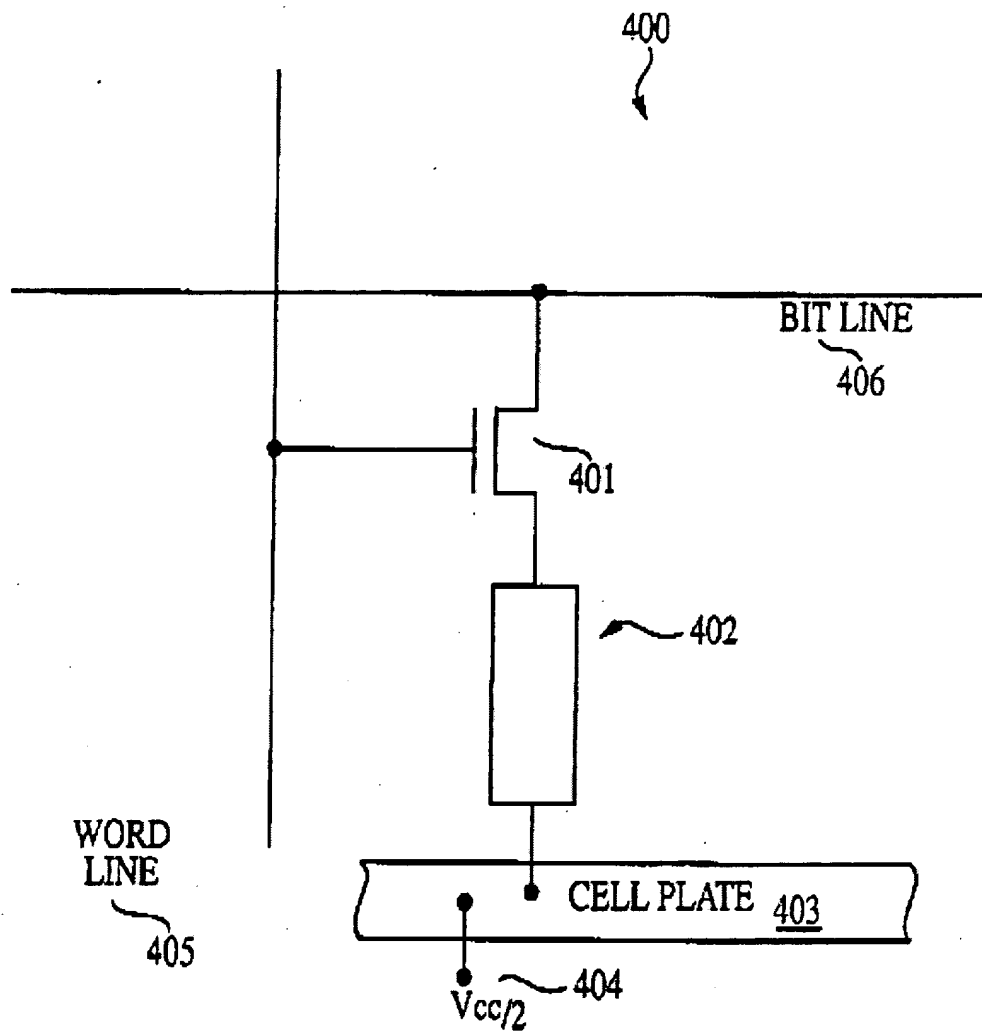


FIG. 2

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10. When responding to the office action, Applicants are advised to provide the examiner with the line numbers and the page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

11. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to be abandoned (see M.P.E.P. 710.02(b)).

12. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d) which papers have been placed of record in the file.

CONCLUSION

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thinh T Nguyen whose telephone number is 571-272-1790. The examiner can normally be reached on Monday-Friday 9:00am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached at 571-272-1787.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval [PAIR] system. Status information for published applications

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may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thinh T. Nguyen

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A handwritten signature in dark ink, appearing to read 'Thinh T. Nguyen', is written over a horizontal line.